


AWARD/CONTRACT		1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)		RATING		PAGE OF PAGES 1 9	
2. CONTRACT (Proc. Inst. Ident.) NO. EP-C-17-031/68HERC22F0068				3. EFFECTIVE DATE See Block 20C		4. REQUISITION/PURCHASE REQUEST/PROJECT NO. PR-ORD-21-01692	
5. ISSUED BY CODE CAD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001		6. ADMINISTERED BY (If other than Item 5) CODE					
7. NAME AND ADDRESS OF CONTRACTOR (No., street, country, State and ZIP Code) TETRA TECH, INC. Attn: George Townsend 10306 EATON PL STE 340 FAIRFAX VA 22030				8. DELIVERY <input type="checkbox"/> FOB ORIGIN <input checked="" type="checkbox"/> OTHER (See below)			
				9. DISCOUNT FOR PROMPT PAYMENT			
				10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN		ITEM	
CODE 198549560		FACILITY CODE					
11. SHIP TO/MARK FOR CODE ORD CIN Office of Research and Development US Environmental Protection Agency 26 West Martin Luther King Drive Cincinnati OH 45268		12. PAYMENT WILL BE MADE BY CODE RTP FMC RTP Finance Center US Environmental Protection Agency RTP-Finance Center (AA216-01) 109 TW Alexander Drive www2.epa.gov/financial/contracts Durham NC 27711					
13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304 (c) () <input checked="" type="checkbox"/> 41 U.S.C. 3304 (a) (1)				14. ACCOUNTING AND APPROPRIATION DATA See Schedule			
15A. ITEM NO	15B. SUPPLIES/SERVICES			15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	Continued						
15G. TOTAL AMOUNT OF CONTRACT						\$77,000.00	
16. TABLE OF CONTENTS							
(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
PART I - THE SCHEDULE				PART II - CONTRACT CLAUSES			
	A	SOLICITATION/CONTRACT FORM		X	I	CONTRACT CLAUSES	3
	B	SUPPLIES OR SERVICES AND PRICES/COSTS		PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.			
	C	DESCRIPTION/SPECS./WORK STATEMENT			J	LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING		PART IV - REPRESENTATIONS AND INSTRUCTIONS			
	E	INSPECTION AND ACCEPTANCE			K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	F	DELIVERIES OR PERFORMANCE			L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	G	CONTRACT ADMINISTRATION DATA			M	EVALUATION FACTORS FOR AWARD	
	H	SPECIAL CONTRACT REQUIREMENTS					
CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE							
17. <input checked="" type="checkbox"/> CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)				18. <input type="checkbox"/> SEALED-BID AWARD (Contractor is not required to sign this document.) Your bid on Solicitation Number 68HERC21R0214 , including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed-bid contract.)			
19A. NAME AND TITLE OF SIGNER (Type or print)				20A. NAME OF CONTRACTING OFFICER Mark Cranley			
19B. NAME OF CONTRACTOR TETRA TECH, INC.		19C. DATE SIGNED		20B. UNITED STATES OF AMERICA BY  (Signature of the Contracting Officer)		20C. DATE SIGNED 11/18/2021	
BY _____ (Signature of person authorized to sign)							

CONTINUATION SHEET

REFERENCE NO. OF DOCUMENT BEING CONTINUED
EP-C-17-031/68HERC22F0068PAGE OF
2 9

NAME OF OFFEROR OR CONTRACTOR

TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
0001	DUNS Number: 198549560 TOCOR: Susan Cormier Delivery: 11/16/2022 Period of Performance: 11/17/2021 to 11/16/2022 Analytics for Watershed Research in accordance with the attached PWS. Product/Service Code: R499 Accounting Info: 21-22-C-26A6000-000FK7XR4-2532-26A6A-2126A6E079-001 1 BFY: 21 EFY: 22 Fund: C Budget Org: 26A6000 Program (PRC): 000FK7XR4 Budget (BOC): 2532 Cost: 26A6A DCN - Line ID: 2126A6E079-001 Funding Flag: Complete Funded: \$60,728.08 Accounting Info: 21-22-C-26A6000-000FK7XR3-2532-26A6A-2126A6E079-002 2 BFY: 21 EFY: 22 Fund: C Budget Org: 26A6000 Program (PRC): 000FK7XR3 Budget (BOC): 2532 Cost: 26A6A DCN - Line ID: 2126A6E079-002 Funding Flag: Complete Funded: \$16,271.92				77,000.00

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract #EP-C-17-031
#PR-ORD-21-01692
Task Order #: TBD

A. TITLE: Analytics for Watershed Research

Task Order Contracting Officer Representative (TOCOR)	Alternate Task Order Contracting Officer Representative (Alt. TOCOR)
Name: Susan Cormier, Ph.D. Office: ORD, CEMM, USEPA 26 W. M. L. King Drive Cincinnati, OH 45268 Phone: 513-569-7995 (voice) FAX: 513-569-2540 (fax) Email: cormier.susan@epa.gov (email)	Name: Michael Griffith, Ph.D. Office: ORD, CEMM, USEPA 26 W. M. L. King Drive Cincinnati, OH 45268 Phone: 513-569-7034 (voice) Email: Griffith.michael@epa.gov

PERIOD OF PERFORMANCE: Date of Task Order (TO) award through 12 months following award

PURPOSE OF TASK ORDER

The primary objective of this task order is to develop new methods for estimating background environmental conditions, developing relationships between stressors and aquatic life, and providing spatially relevant assessments. Related to these efforts is the effort to better predict how background affects aquatic life in response to natural and man-made influences. The success of this effort will be based on the ability of EPA personnel to understand and repeat developed analyses using the open source program R, ArcGIS, and Microsoft as described in Task 4 and the crafting of manuscripts and other publicly available materials that report the research details of the development process for the field-based methods. The second objective of the Task Order is to provide greater transparency and accessibility of the supporting analyses used to produce all methods developed as a part of this Task Order and earlier related Task Orders.

BACKGROUND

The US Environmental Protection Agency's (EPA) Office of Research and Development (ORD), Center for Environmental Measurement and Modeling (CEMM) develops, evaluates, and applies measurements and models to characterize the sources, occurrence, transformation, transport and effects of pollutants and stressors in the natural environment. This work

provides fundamental methods and models required to implement environmental statutes. CEMM research also identifies approaches and tools to inform effective management of water/airsheds and ecosystems. These efforts inform human and ecological exposure, health, and risk assessments. To fulfill this mission, CEMM scientists collaborate and partner within and outside of ORD to deliver solutions-driven research that is responsive and impactful.

Research products from CEMM is used by states, tribes, businesses, non-government agencies, EPA's program and regional office managers who use the information for making planning, regulatory, enforcement, and remedial-action decisions. CEMM is committed to developing methods using field observations and models to enable decision making to adapt to changes in water quantity and quality. To fulfill this mission, CEMM requires the expertise and support as described in the contract Performance Work Statement (PWS).

Water quality and quantity is affected by natural and man-made situations, such as, hydrologic permanence affected by drought or water removal, land-cover alteration by fire or urban development, and direct and indirect loadings by weathering, run-off, or waste discharges. The more we understand the processes that affect water quality and quantity, the better positioned we are to minimize or adapt to changing conditions and societal needs. This Task Order supports completed work to estimate natural background water quality and quantity and expands efforts to other stressors as well as other locations. It also supports completed research to characterize causal relationships between sources of change and changes to water quality and quantity. These causal relationships may be used to evaluate stream condition, to assess agents and sources, to predict changing conditions, and to evaluate how decisions have or have not influenced water quality and quantity.

QUALITY ASSURANCE

The tasks in this Task Order require the use of existing data and use of modeling tools for data analysis. The Contractor shall use the existing a Quality Assurance Project Plan (QAPP) QAPP-Support for Field-based Criteria (B-CIN-0030155) recently renumbered and heretofore referred to as J-WECD-0030155-QP-1-0. If an addendum to the QAPP is required, the contractor shall prepare the addendum and submit for to the EPA within 30 days. All QA activities shall be in conformance with this QAPP. Documentation of all analyses shall also indicate how types, quantity, and quality of data have been quality assured and maintained. In addition, the contractor shall ensure that metadata is compiled in an easy to use format. All products should be detailed so that the decisions and analysis are completely transparent to a third party. The Contractor shall alert the TOCOR regarding any quality issues should they arise. Any project specific quality assurance issues shall be reported in the monthly progress reports as specified under Task 1. The QA activities for this Task Order should comprise at least 10% of the total effort.

SCOPE OF WORK

The purpose of this Task Order is to obtain contractor services to address new and/or modified analyses to advance the use of field data for characterizing stressor response relationships and support tools to enable states, tribes and other assessors to readily use these methods. The specific tasks are defined below. Written exchanges for Technical Exchange shall be provided to the contractor for clarification purposes provided by the TOCOR. Any verbal technical exchange shall be provided to the TOCOR in writing within 3 days.

Task 1: Establish Communication and Prepare Reporting Schedule

The Contractor shall establish communication with the TOCOR and develop a regular reporting schedule. The Contractor shall contact the TOCOR and schedule a kickoff project meeting. In discussion with the TOCOR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Task Order. Topics of discussion shall include roles and responsibilities, points of contact and documentation protocols, timelines, QAPP, milestones and deliverables, and other Task Order administrative activities.

This task requires coordination with other EPA offices and federal and state agencies. The Contractor shall notify the TOCOR of issues, problems, questions, or delays which may be anticipated or as soon as they become apparent. The TOCOR may modify the frequency of conference calls based on project progress. From TOCOR may invite researchers from other federal agencies to provide perspectives and information. Also see Section 2, Task Area 6, Support Communication of Products and Information in Contract PWS.

Task 1. Deliverables

1.1	Brief, written progress reports as email to the TOCOR		Due monthly or upon request by the TOCOR for the duration of this Task Order.
1.2	Project meetings summaries and other communications, such as conference calls		Due three days after the meeting

Task 2: Prepare and Implement QAPP

The Contractor shall review, update and submit for approval the previously approved QAPP # J-WECD-0030155-QP-1-0 within 30 days after TO award. The TOCOR and the EPA QA Manager will review and approve any changes. Changes to the existing QAPP shall include updates to personnel, changes to the approach and measures the Contractor shall implement to ensure a

high standard of quality in data analysis and written deliverables. The Contractor shall not proceed with tasks needing QA review until the TOCOR notifies the contractor that the QAPP has been accepted by EPA.

All QA activities shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5) <https://www.epa.gov/quality/guidance-quality-assurance-project-plansepa-qag-5> and should demonstrate a clear understanding of the project's goals/objectives/questions and issues. Documentation of all analyses shall also indicate how types, quantity, and quality of data have been quality assured and maintained. In particular, the quality assurance shall also ensure that metadata is compiled in an easy to use format accessible to EPA as described in Tasks 3 and 4. All products should be detailed so that the decisions and analysis are completely transparent to a third party. The Contractor shall notify the TOCOR of any quality issues that develop.

Task 2. Deliverables

2.1	Existing QAPP or QAPP addendum if required submitted to the TOCOR and QA Manager for review.		Due 30 days after Task Order award
2.2	A final updated QAPP submitted to the TOCOR for approval.		Due 1 week after TOCOR approval of Deliverable 2.1

Task 3: Develop methods and analyze case examples (Section 2 in Contract Level PWS, Task Area 2: Manage Data and Information, Task Area 4: Task Area 5: Develop and Enhance Information Technology Tools and Applications Conduct Data Analyses and Modeling.)

The contractor shall develop and refine methods to support field-based methods for condition, causal, predictive and outcome assessments. The contractor shall also use case examples to characterize the confidence and uncertainties in predictions using these developed methods and models. The TOCOR will describe needed tasks at the kick-off meeting and follow with a written summary of the status of the product and technical discussions as needed and as described in Tasks 3.1 and 3.2.

It is anticipated that work shall include methods to assess stream water quality and quantity at the reach scale. It is also expected that detailed examples of water quality, quantity, and biological effects shall be performed at the watershed or national scale.

The contractor shall prepare scientific products appropriate for each basic or advanced analysis. These may include but are not limited to power point presentations, manuscripts, reports,

HTML web material, R-code modules, Excel modules, data sets and metadata for publication, data dictionaries, ESRI GIS processes, and GitHub ready code and data sets. The contractor may be required to obtain additional data from third party sources such as state or federal entities.

Task 3.1: Statistical analyses, Database construction, Report sections (Basic) These include routine activities such as: writing up methods, performing QA check on databases, obtaining databases, querying data bases, and frequentist analyses such as but not limited to descriptive statistics (e.g., mean, median, centiles, etc.), correlation analysis, box plots, contingency tables, and analyses such as conversion of units, and running regression models. About 13 basic analyses are anticipated for Task 3.1 and shall be initiated by written technical exchanges from the TOCOR.

Task 3.1 Deliverables

3.1	Description of proposed analytical method for each analysis		Within 5 business days after completion of analyses
3.2	Interim analytical results		Usually within 5 business days
3.3	Description of methods, data sets and all product outputs		Within 20 business days of completion of analysis

Task 3.2: Complex statistical analyses, spatial analysis, model development (Advanced) These activities require more sophisticated skills and synthesis of disparate information. The verification of analyses and validation of models adds complexity that increases time needed to perform the work. The QA and metadata pedigree (Task 4) should include the basic analyses that led to or contributed to the more complex analysis, see Task 3.1. This shall reduce redundancy of reporting data sources, R-code and related scientific work. About 15 advanced analyses are expected for Task 3.2 and shall be initiated by written technical exchanges from the TOCOR.

Task 3.2 Deliverables

3.2.1	Description of proposed analytical method for each analysis		Within 5 business days after completion of analyses
3.2.2	Interim analytical results		Usually within 20 business days, but may be longer for very complex analyses or models
3.2.3	Description of methods, data sets and all product outputs		Within 20 business days of completion of analysis

Task 4: Provide Metadata (Section 2 in Contract PWS, Task Area 2: Manage Data and Information)

The Contractor shall provide complete metadata for all manipulations of datasets, documentation of all figures, tables, and analyses performed in conjunction with the development of the reports including all appendices and supporting analyses such as validation of models and predicted values. Datasets and corresponding data dictionaries used for all the analyses shall be provided as flat files (e.g., tab, or comma-delimited) as well as a data dictionary. Files shall be sorted into logical folders such as R-codes, ESRI ArcGIS codes, excel work sheets, data sets, figures, tables, text and all other materials related to the generation of maps, statistical analysis and numeric outputs, etc. The metadata shall be linked to a table of contents. The open source R-code shall be split into separate preprocessing and analytic functions. The TOCOR will provide the Contractor with an example of a completed data pedigree to use.

The Contractor shall use TOCOR approved open source software "R" for statistical analyses unless otherwise specified. Annotated code and data sets should be retained and submitted when providing results. Results and figures should be provided as well as the html, ppt, pdf, eps or other image software approved by the TOCOR that was used to produce the results or figures. Formulae for fitted lines should be provided. All final images should be a minimum of 300 dpi, whereas figures for publication should be 500 dpi or greater.

Any spatial analysis, that is, the use of Geographic Information System (GIS) tools, functions, geoprocessing, and operations (e.g. map overlay, spatial query) of geographically-referenced data, shall include either a flow chart or model-builder steps that depict the data management and analysis of the GIS layers. If any scripts are used in the GIS analysis, those scripts should be annotated, retained, and submitted when providing results. Any maps produced from a GIS system shall include the source information of the data shown in the map and map projection, which may be in Adobe PDF files, R coded GIS, or ESRI Arc GIS format by written technical

exchange. Federal Data Geographic Committee (FGDC) compliant metadata shall be developed for any newly developed GIS datasets for use with this tool.

After the construction of the metadata pedigree, the Contractor shall test the final product by having non-development personnel rerun all scripts.

Task 4. Deliverables

4.1	Metadata of analyses	Within 30 business days after completion of analyses
4.2	Complete QA and metadata pedigree	At the completion of Task 3.2

Technical Expertise Required for Key Contractor Staff:

The key technical individual(s) must have experience with development of physical, chemical and aquatic life exposure-response relationships including toxic (e.g. organics and metals) and naturally occurring stressors (e.g., minerals, sediment, nutrients) and varied aquatic life (e.g., algae, invertebrates, fish). This work requires biostatistics (particularly the ability to write and review R and ESRI ArcGIS code), understanding of water chemistry as it relates to non-conventional pollutants and effects on aquatic life, and the relevant body of literature.

ACCEPTANCE CRITERIA

The Contractor shall prepare high quality products and that are reproducible and transparent. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or TIFF files. Text deliverables shall be provided in Microsoft Word 2016 or compatible format. Geographic deliverables shall be in either ArcGIS or R and be FGDC compliant. Databases and statistical analyses shall use R and Excel formats.

Deliverables and Schedule

<i>Task 1. Communication Deliverables</i>			
1.1	Brief, written progress reports as email to the TOCOR		Due monthly or upon request by the TOCOR for the duration of this Task Order.
1.2	Project meetings and other communications, such as conference calls,		Due upon request by the TOCOR for the duration of this Task Order.
<i>Task 2. QA Deliverables</i>			
2.1	Draft QAPP submitted to the TOCOR and QA Manager for review.		30 days after Task Order award
2.2	Revised QAPP addressing TOCOR comments on the draft submitted to the TOCOR for approval.		Due 1 week after TOCOR approval of Deliverable 2.1.
<i>Task 3.1. Analytical Deliverables (13 Basic)</i>			
3.1.1	Description of proposed analytical method for each analysis		Within 5 business days after completion of analysis
3.1.2	Interim analytical results		Usually within 5 business days
3.1.3	Description of methods, data sets and all product outputs		Within 20 business days of completion of analysis
<i>Task 3.2. Analytical Deliverables (15 Advanced)</i>			
3.2.1	Description of proposed analytical method for each analysis		Within 5 business days after completion of analyses
3.2.2	Interim analytical results		Usually within 20 business days, but may be longer for very complex analyses or models
3.2.3	Description of methods, data sets and all product outputs		Within 20 business days of completion of analysis
<i>Task 4. Documentation Deliverables</i>			
4.1	Metadata of analyses		Due within 30 business days after completion of analyses
4.2	Complete QA and metadata pedigree		Due at the completion of Task 3.2